# TENEBRIO ANTIFREEZE PROTEINS

## ABSTRACT OF THE DISCLOSURE

A novel class of thermal hysteresis (antifreeze) proteins (THP) that have up to 100 times the specific activity of fish antifreeze proteins has been isolated and purified from the mealworm beetle, *Tenebrio molitor*. Internal sequencing of the proteins, leading to cDNA cloning and production of the protein in bacteria has confirmed the identity and activity of the 8 4 to 10.7 kDa THP. They are novel Thr- and Cys-rich proteins composed largely of 12-amino-acid repeats of cys-thr-xaa-ser-xaa-xaa-cys-xaa-xaa-ala-xaa-thr. At a concentration of 55 $\mu$g/mL, the THP depressed the freezing point 1.6°C below the melting point, and at a concentration of ~1 mg/mL the THP or its variants can account for the 5.5°C of thermal hysteresis found in *Tenebrio* larvae. The THP function by an adsorption-inhibition mechanism and produce oval-shaped ice crystals with curved prism faces.